# DRAFT ENGINEERING EVALUATION

**Plant 9255: San Francisco Campus for Jewish Learning**
302 Silver Avenue, San Francisco, CA, 94112

**Application 29726: Emergency Standby Diesel Engine-Generator Set**

## BACKGROUND

**San Francisco Campus for Jewish Learning (SFCJL)** has applied for an Authority to Construct (AC) and/or a Permit to Operate (PO) for the following equipment:

**S-4 Emergency Standby Diesel Engine-Generator Set;**
**Engine: Iveco/FPT; Model F3BE9685A-E;**
**Model Year 2018; EPA Engine Family JFPXL12.9IGR**
**12.9 L Displacement; 530 BHP; 27.02 gph diesel consumption; 6 cylinders**
**Abated by A-4**

**A-4 Diesel Catalyzed Particulate Filter; Johnson Matthey CRT(+) 4-N-MS-BITO-A/A-RT**
**CARB-verified Level 3 device with ≥ 85% particulate control, CARB Executive Order DE-08-009-09**

S-4/A-4 will be located at 1 Avalon St., San Francisco, CA, 94112. S-4/A-4 diesel engine will drive an emergency generator to provide electric power during an emergency/testing. S-4 is Environmental Protection Agency-certified Tier 3 engine but it will comply with California Air Resources Board (CARB) Air Toxics Control Measure (ATCM) and the District's Best Available Control Technology (BACT) requirements. Moreover, S-4 will be abated by CARB-verified diesel particulate filter with a minimum particulate reduction efficiency of 85%.

## EMISSIONS SUMMARY

Except for sulfur dioxide (SO2), the unabated emission factors for other pollutants from S-4 were obtained from EPA's engine certification for the EPA Certification # JFPXL12.9IGR-004. The SO2 emissions were calculated based on the maximum allowable sulfur content (0.0015% Sulfur by weight) of the diesel fuel with the assumption that all the sulfur present will be converted to SO2 during the combustion process. Abated emissions of carbon monoxide (CO), particulate matter less than 10 micrometer aerodynamic diameter ($PM_{10}$), and Non-methane hydrocarbon (NMHC) or Precursor organic compounds (POC) were estimated using the abatement device (A-4) manufacturer's guaranteed % reduction.

Basis:

- 530 brake horsepower (BHP) rated engine power
- Annual emissions based on 50 hours/year operation for testing and maintenance
- Maximum daily emissions are based on 24 hours/day of operation
- 27.02 gallons/hour maximum fuel use rate used to estimate heat input rate of 3.7 million british thermal unit per hour (MMBtu/hour)
- Unabated NMHC or POC, oxides of nitrogen (NOx), CO, and $PM_{10}$ emission factors provided by EPA Certification #: # JFPXL12.9IGR-004
- $SO_2$ emissions are quantified based on the full conversion of 0.0015% (~ 15 parts per million) sulfur by weight in the ultra-low sulfur diesel fuel. The $SO_2$ emission factor was derived from EPA AP-42, Table 3.3-1.
- Per District Policy[1] when the NMHC and NOx emission factors are combined, assume a breakdown of 5% and 95%, respectively.
- Controlled POC, CO and PM10 emissions are based on the manufacturer guaranteed abatement efficiency of 70%, 80%, and 85%, respectively.

Table 1 summarizes estimated emissions from S-4/A-4.

[1] http://www.baaqmd.gov/~/media/Files/Engineering/policy_and_procedures/Engines/EmissionFactorsforDieselEngines.ashx

**Table 1 – Estimated Emissions from S-4/A-4**

| Pollutant | Uncontrolled Emission Factor | | Uncontrolled Annual Emissions | Uncontrolled Max. Daily Emissions | Abatement Efficiency | Controlled Annual Emissions | Controlled Annual Emissions | Controlled Max. Daily Emissions |
|---|---|---|---|---|---|---|---|---|
| | (g/kw-hr) | (g/hp-hr) | (lb/yr) | (lb/day) | % | (lb/yr) | (TPY) | |
| NMHC+NOx | 3.80 | 2.8 | | | | | | |
| NOx | 3.61 | 2.69 | 157.13 | 75.42 | 0% | 157 | 0.079 | 75.42 |
| POC | 0.19 | 0.14 | 8.27 | 3.97 | 70% | 2.48 | 0.001 | 1.19 |
| CO | 0.80 | 0.6 | 34.82 | 16.71 | 80% | 6.96 | 0.003 | 3.34 |
| $PM_{10}$ | 0.17 | 0.13 | 7.40 | 3.55 | 85% | 1.11 | 0.001 | 0.53 |
| $SO_2$ | | 0.00155 lb/MMBtu | 0.29 | 0.14 | 0% | 0.29 | 0.0001 | 0.14 |

## PLANT CUMULATIVE INCREASE

Table 2 summarizes the cumulative increase in criteria pollutant emissions that will result from this application.

**Table 2 Cumulative Increase**

| Pollutant | Permitted Emissions (since April 5, 1991) | Emissions Increase with This Application | Cumulative Emissions Increase |
|---|---|---|---|
| | (TPY) | (TPY) | (TPY) |
| NOx | 0.000 | 0.079 | 0.079 |
| POC | 0.000 | 0.001 | 0.001 |
| CO | 0.000 | 0.003 | 0.003 |
| PM10 | 0.000 | 0.001 | 0.001 |
| SO2 | 0.000 | 0.000 | 0.000 |
| PM2.5* | 0.000 | 0.001 | 0.001 |
| *Particulate matter less than 2.5 micrometer aerodynamic diameter (PM2.5) is assumed to be equal to PM10 | | | |

## TOXIC HEALTH RISK ASSESSMENT (HRA)

All $PM_{10}$ emissions are considered diesel particulate matter (DPM) emissions. Annual DPM emissions of 1.11 pounds/year from S-4/A-4 are above the District's DPM chronic trigger level of 0.26 pounds/yr in Regulation 2-5, Table 2-5-1. Therefore, an HRA is required.

S-4/A-4 is subject to the District's HRA streamlining policy for stationary diesel-fueled combustion engines used for backup power or fire pumps. The included HRA streamlining policy checklist shows that a refined HRA is required for this permit application because the nearest receptor is less than 100 feet from the emission point.

Based on 50 hours per year of operation, S-4/A-4 passed the HRA. The source poses no significant toxic risk. The increased cancer risk to the maximally exposed receptor resident (MEIR) is 0.46 in a million with a hazard index of 0.00012. The increased cancer risk to the maximally exposed receptor worker (MEIW) is 0.16 in a million with a hazard index of 0.00012. The increased cancer risk to the nearby student receptor attending the SF Community Alternative School is 0.017 in a million with a hazard index of 0.0000093. The increased cancer risk to the nearby student receptor attending the Monroe Elementary School is 0.012 in a million with a hazard index of 0.0000065. S-4/A-4 is not subject to Best Available Control Technology for toxics (TBACT) requirement because the cancer risk levels at MEIR, MEIW, or student receptors are below 1.0 in a million and the hazard indices are below 0.20. Nevertheless, unabated S-4 meets TBACT because the unabated diesel exhaust particulate matter emission rate of 0.13 g/bhp-hour is less than TBACT emissions level of 0.15 g/bhp-hr. Furthermore, S-4 will be abated by A-4 resulting in a diesel exhaust particulate matter emission rate of 0.02 g/bhp-hour. The HRA shows that S-4 also meets the project risk requirements of 10.0 in a million cancer risk and 1.0 hazard index.

## BEST AVAILABLE CONTROL TECHNOLOGY (BACT)

Per Regulation 2-2-301.1, BACT is triggered for a District BACT pollutant if a new source has a potential to emit (PTE) 10.0 or more pounds per day of that pollutant. BACT is a source and pollutant specific requirement.

Per Table 1, S-4/A-4 triggers BACT for NOx since the maximum daily emissions exceed 10.0 lb/day. BACT for this source type is presented in the current BAAQMD BACT/TBACT Workbook for IC Engine – *Compression Ignition: Stationary Emergency, non-Agricultural, non-direct drive fire pump, Document # 96.1.3*, Revision 7 dated 12/22/2010. Table 3 summarizes the EPA-certified emission rates for S-4/A-4 and compares them to emission rates found in Table 1 of the above BACT document # 96.1.3. For NOx, CO, POC and $PM_{10}$, BACT(2) is the CARB ATCM standard for the respective pollutant at the applicable horsepower rating. For $SO_2$, BACT(2) is using fuel with sulfur content not to exceed 0.0015%, or 15 ppm. The more restrictive BACT(1) standards are not applicable to this engine because it will be limited to operation as an emergency standby engine.

**Table 3: Comparison of Emission Rates of S-4 with BACT Requirements**

| Pollutant | EPA Certified Emission Rates of S-4 g/kW-hr (g/bhp-hr) | District's BACT 2 Limits Based on CARB ATCM Emission Rates g/kW-hr (g/bhp-hr) |
|---|---|---|
| NMHC + NOx | 3.8 (2.8) | 4.0 (3.0) |
| CO | 0.8 (0.6) | 3.5 (2.6) |
| PM | 0.17 (0.13) | 0.20 (0.15) |

It can be seen from Table 3 above that S-4 meets the District's prevailing BACT(2) standards.

**OFFSETS**

Regulation 2-2-302 requires offsets for NOx and POC emission increases from any new or modified source if the facility-wide PTE of that pollutant is greater than 10 tons/year. Regulation 2-2-303 requires offsets for PM2.5, PM10, and SO2 emission increases from any new or modified source if the facility-wide PTE of that pollutant is greater than 100 tons/year and if the un-offset cumulative increase in emissions of that pollutant at the facility and any related sources since the baseline date exceeds 1 ton per year.

Table 4 summarizes the increase in criteria pollutant emissions and offset requirement due to S-4/A-4.

**Table 4: Cumulative Emissions and Offset Requirement**

| Pollutant | Facility-wide Pre-Project PTE at 100 Hours for Emergency Operation + Permitted Non-emergency Operation (TPY) | Facility-wide Post Project PTE at 100 Hours for Emergency Operation + Permitted Non-emergency Operation (TPY) | Actual Facility Emissions per Most Recent District Inventory (TPY) | Total Permitted Emissions (Pre- + Post – 4/5/1991) (TPY) | Emissions Increase with This Application (TPY) | Adjusted Total Facility Emissions or Un-offset Cumulative Increase (TPY) | Regulation 2-2-302 and 2-2-303 Offset Triggers (TPY) |
|---|---|---|---|---|---|---|---|
| NOx | 2.502 | 2.737 | 0.467 | 0.000 | 0.079 | 2.737 | Post-project Facility-wide PTE > 10 tpy |
| POC | 0.203 | 0.207 | 0.036 | 0.000 | 0.001 | 0.207 | Post-project Facility-wide PTE > 10 tpy |
| CO | 0.539 | 0.550 | 0.101 | 0.000 | 0.003 | 0.550 | NA |
| PM10 | 0.178 | 0.179 | 0.007 | 0.000 | 0.001 | 0.001 | > 1.0 CI and 100 tpy post-project facility-wide PTE |
| SO2 | 0.001 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | > 1.0 CI and 100 tpy post-project facility-wide PTE |
| PM2.5 | 0.178 | 0.179 | 0.007 | 0.000 | 0.001 | 0.001 | > 1.0 CI and 100 tpy post-project facility-wide PTE |

Although the application was deemed complete before the policy "*Calculating Potential to Emit for Emergency Backup Power Generators*" dated 6/3/2019 became effective, the facility-wide PTE in Table 4 was estimated in accordance with this policy and is based on 100 hours of emergency operation and additional non-emergency operation as allowed by individual back-up generator's permit condition. The facility operates three back-up engines (S-1, S-2, S-3), which were permitted as Loss of Exemption (LOE) engines. These pre—2000 model year engines

are permitted to operate for 20 hours per years for reliability-related testing. Emission factors for these engines were obtained from AP-42 Chapter 3.3. Emissions from all engines are summarized Table 5.

**Table 5 Annual Emissions from Existing and New Emergency Engines (lb/year)**

| Source | AP-42 Chapter 3.3 Emission Factors for LOE Engines (lb/HP-hr) | S-1 Emissions (lb/yr) | S-2 Emissions (lb/yr) | S-3 Emissions (lb/yr) | S-4 Emissions (lb/yr) | Total Annual Emissions (lb/year) |
|---|---|---|---|---|---|---|
| **AN** | | 27258 | 27258 | 27258 | 29726 | |
| **Permit Condition** | | 22820 | 22820 | 22820 | 22850 | |
| **Type** | | LOE | LOE | LOE | New | |
| **HP** | | 519 | 600 | 226 | 530 | |
| **Non-emergency Operating Time (hr/year)** | | 20 | 20 | 20 | 50 | |
| **Emergency Operating Time per District Policy (hr/year)** | | 100 | 100 | 100 | 100 | |
| **NOx** | **3.10E-02** | 1930.7 | 2232.0 | 840.7 | 471.39 | 5474.8 |
| **POC** | **2.51E-03** | 156.6 | 181.0 | 68.2 | 7.44 | 413.2 |
| **CO** | **6.68E-03** | 416.0 | 481.0 | 181.2 | 20.89 | 1099.0 |
| **PM10** | **2.20E-03** | 137.0 | 158.4 | 59.7 | 3.33 | 358.4 |
| **SO2*** | **1.09E-05** | 0.7 | 0.8 | 0.3 | 0.86 | 2.6 |
| **PM2.5** | **2.20E-03** | 137.0 | 158.4 | 59.7 | 3.33 | 358.4 |

*Emission Factor for SO2 is based on 15 ppmw sulfur content, Heating Value of Diesel = 19300 Btu/lb, and Brake Specific Fuel Consumption of Diesel = 7000 Btu/HP-hr
SO2 Emission Factor (lb/HP-hr) = 15 ppmw * 64 lb SO2 per Mole/ 32 lb S per mole / 19300 btu per lb diesel * 7000 Btu/HP-hr

As shown in Table 4, the post-project, facility-wide PTE will not exceed 10 tpy for NOx and POC. The post-project facility-wide PTE will not exceed 100 tpy for PM10, SO2, and PM2.5 emissions. Therefore, offsets are not required for emission increases of any pollutant.

## STATEMENT OF COMPLIANCE

The owner/operator is expected to comply with all applicable requirements. Key requirements are listed below:

### Airborne Toxic Control Measure (ATCM) for Stationary Compression Ignition Engines

S-4 is subject to ATCM, 5/19/2011, Section 93115, Title 17, California Code of Regulations. As shown in Table 6 below, S-4 meets ATCM requirements in Table 1 of Section 93115 for 2008+ model year engines.

**Table 6 ATCM Emission Standard Compliance**

| | Emissions from S-4 g/bhp-hr | ATCM §93115 Standard g/bhp-hr | NSPS Subpart IIII g/bhp-hr |
|---|---|---|---|
| NMHC+NOx | 2.8 | 3.0 | 3.0 |
| CO | 0.6 | 2.6 | 2.6 |
| PM | 0.13 | 0.15 | 0.15 |

### New Source Performance Standards (NSPS)

S-4 is subject to 40 CFR 60, Subpart IIII, Standards of Performance for Stationary Compression Ignition Internal Combustion Engines. Section 60.4205(b) requires S-4 to comply with the emission standards in Section 60.4202(a)(2), which refers to 40 CFR 89.112 and 40 CFR 89.113 for all pollutants. Table 6 summarizes the Tier 3 emission standards in Table 1 of 40 CFR 89.112 (a) that apply to S-4. As shown in Table 6 above, S-4 will comply with the emissions standards in NSPS IIII. S-4 will comply with fuel sulfur content requirement in NSPS IIII Section 60.4207(b) because CARB diesel sold in California meets the above standards.

S-4/A-4 will comply NSPS IIII Section 60.4209, which requires installation of non-resettable hour meter on the engines and a backpressure monitor on A-4 diesel particulate filter, because the requirement will be incorporated in the permit condition.

S-4 will comply with the requirement in Section 60.4211(f) to run for less than 100 hours per year for maintenance checks and readiness testing, and the prohibition of running for any reason other than emergency operation, maintenance, and testing because the engines are limited by permit condition #22850 to 50 hours per year for reliability testing and otherwise may only operate for emergencies.

Because S-4 will have diesel particulate filter, the owner/operator is subject to Section 60.4214(c) which requires them to keep records of any corrective action taken after the backpressure monitor has notified the owner/operator that the high backpressure limit of the engine is approached. This requirement is incorporated in permit condition #24354 and so the owner/operator is expected to comply with this requirement.

The owner/operator is required to comply with certain sections of 40 CFR 60, Subpart A, General Provisions. The owner/operator is expected to comply with this requirement.

**National Emissions Standards for Hazardous Air Pollutants (NESHAP)**

S-4 is subject to 40 CFR 63, Subpart ZZZZ (Stationary Reciprocating Internal Combustion Engines (RICE)). Per NESAHP 40 CFR Section 63.6590(c)(1), S-4 is required to meet the requirements in 40 CFR 63, Subpart ZZZZ by meeting the requirements in NSPS IIII.

**District Rules**

S-4 is expected to comply with Regulation 6-1-303.1, which limits the visible emissions to Ringelmann No. 2 or an opacity of 40% for no more than 3 minutes in any hour.

S-4 is expected to comply with Regulation 9-1-301, which limits the ground level concentrations of SO2 to 0.5 ppm continuously for 3 consecutive minutes or 0.25 ppm averaged over 60 consecutive minutes, or 0.05 ppm averaged over 24 hours.

S-4 is exempt from the emission rate limits in Regulation 9, Rule 8 ("Inorganic Gaseous Pollutants - NOx and CO from Stationary Internal Combustion Engines") Sections 9-8-301 through 305 and from Sections 501 and 503 per Reg. 9-8-110.5 (Emergency Standby Engines). S-4 is subject to and is expected to comply with 9-8-330.3 (Emergency Standby Engines, Hours of Operation) since non-emergency hours of operation will be limited in the permit conditions to 50 hours per year. S-4 is also subject to and is expected to comply with monitoring and record keeping requirements of Regulations 9-8-502.1 and 9-8-530, which are incorporated into the proposed permit conditions.

**California Environmental Quality Act (CEQA)**

This project is ministerial under the District Regulation 2-1-311 (Permit Handbook Chapter 2.3.1) and is therefore, not subject to CEQA review.

**Prevention of Significant Deterioration (PSD)**

The project will not trigger a PSD review because the facility is not a major facility per Regulation 2-2-304.

**Major Facility Review**

Major facility review per Regulation 2-6 is also not triggered because this facility is not a major facility, not a phase II acid rain facility, not a subject solid waste incinerator, and not a designated facility.

**School Notification (Regulation 2-1-412)**

S-4 is located less than 1,000 feet from three K-12 schools and is therefore, subject to the public notification requirements of Regulation 2-1-412. A public notice will be prepared and sent to all addresses within 1,000 feet of S-4 and parents and guardians of students of the following school(s):

San Francisco Community Alternative School
125 Excelsior Avenue, San Francisco, CA, 94112

Monroe Elementary School
260 Madrid Street, San Francisco, CA, 94112

Stratford School – San Francisco Middle School
75 Francis St, San Francisco, CA 94112

All comments received shall be summarized in final evaluation report.

**PERMIT CONDITIONS**

COND# 22850 ----------

1. The owner/operator shall not exceed 50 hours per year per engine for reliability-related testing.
   [Basis: Title 17, California Code of Regulations, section 93115, ATCM for Stationary CI Engines]

2. The owner/operator shall operate each emergency standby engine only for the following purposes:
   to mitigate emergency conditions, for emission testing to demonstrate compliance with a District, State or Federal emission limit, or for reliability-related activities (maintenance and other testing, but excluding emission testing). Operating while mitigating emergency conditions or while emission testing to show compliance with District, State or Federal emission limits is not limited.
   [Basis: Title 17, California Code of Regulations, section 93115, ATCM for Stationary CI Engines]

3. The owner/operator shall operate each emergency standby engine only when a non-resettable totalizing meter (with a minimum display capability of 9,999 hours) that measures the hours of operation for the engine is installed, operated and properly maintained.
   [Basis: Title 17, California Code of Regulations, section 93115, ATCM for Stationary CI Engines]

4. Records: The owner/operator shall maintain the following monthly records in a District-approved log for at least 36 months from the date of entry (60 months if the facility has been issued a Title V Major Facility Review Permit or a Synthetic Minor Operating Permit). Log entries shall be retained on-site, either at a central location or at the engine's location, and made immediately available to the District staff upon request.
   a. Hours of operation for reliability-related activities (maintenance and testing).
   b. Hours of operation for emission testing to show compliance with emission limits.
   c. Hours of operation (emergency).
   d. For each emergency, the nature of the emergency condition.
   e. Fuel usage for each engine(s).
   [Basis: Title 17, California Code of Regulations, section 93115, ATCM for Stationary CI Engines]

5. At School and Near-School Operation:
   If the emergency standby engine is located on school grounds or within 500 feet of any school grounds, the following requirements shall apply:
   The owner/operator shall not operate each stationary emergency standby diesel-fueled engine for non-emergency use, including maintenance and testing, during the following periods:
   a. Whenever there is a school sponsored activity (if the engine is located on school grounds)
   b. Between 7:30 a.m. and 3:30 p.m. on days when school is in session.

   "School" or "School Grounds" means any public or private school used for the purposes of the education of more than 12 children in kindergarten or any of grades 1 to 12, inclusive, but does not include any private school in which education is primarily conducted in a private home(s). "School" or "School Grounds" includes any building or structure, athletic field, or other areas of school property but does not include unimproved school property.
   [Basis: Title 17, California Code of Regulations, section 93115, ATCM for Stationary CI Engines]

***End of Conditions***

COND# 24354 ----------

1. The owner/operator shall abate the particulate emissions from the emergency diesel engine with a Diesel Particulate Filter at all times the engine is in operation.
   [Basis: "ATCM for Stationary Compression Ignition Engines" Section 93115.6(a)(3) or 93115.6(b)(3), Title 17, CA Code of Regulations]

2. The owner/operator shall install and maintain a backpressure monitor that notifies the owner or operator when the high backpressure limit of the engine is approached. The owner/operator shall maintain records of any corrective action taken after the backpressure monitor has notified the owner or operator that the high backpressure limit of the engine is approached in a District-approved log for at least 36 months from the date of entry (60 months if the facility has been issued a Title V Major Facility Review Permit or a Synthetic Minor Operating Permit).
   [Basis: "ATCM for Stationary Compression Ignition Engines" Section 93115.10(d), Title 17, CA Code of Regulations; 40 CFR 60.4214c]

***End of Conditions***

**RECOMMENDATION**

The District has reviewed the material contained in the permit application for the proposed project and has made a preliminary determination that the project is expected to comply with all applicable requirements of District, state, and federal air quality-related regulations. The preliminary recommendation is to issue an Authority to Construct for the equipment listed below. However, the proposed sources will be located within 1,000 feet of at least one school, which triggers the public notification requirements of Regulation 2-1-412. After the comments are received and reviewed, the District will make a final determination on the permit.

I recommend that the District initiate a public notice and consider any comments received prior to taking any final action on issuance of an Authority to Construct and/or a Permit to Operate for the following equipment:

**S-4 Emergency Standby Diesel Engine-Generator Set;**
**Engine: Iveco/FPT; Model F3BE9685A-E;**
**Model Year 2018; EPA Engine Family JFPXL12.9IGR**
**12.9 L Displacement; 530 BHP; 27.02 gph diesel consumption; 6 cylinders**
**Abated by A-4**

**A-4 Diesel Catalyzed Particulate Filter; Johnson Matthey CRT(+) 4-N-MS-BITO-A/A-RT**
**CARB-verified Level 3 device with ≥ 85% particulate control, CARB Executive Order DE-08-009-09**

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Snigdha Mehta
Air Quality Engineer
Engineering Division